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THERMAL AND ALBEDO MAPPING OF THE NORTH AND SOUTH POLAR REGIONS OF MARS; D. A. Paige and K. D. Keegan, Dept. of Earth and Space Sciences, UCLA, Los Angeles, CA 90024.

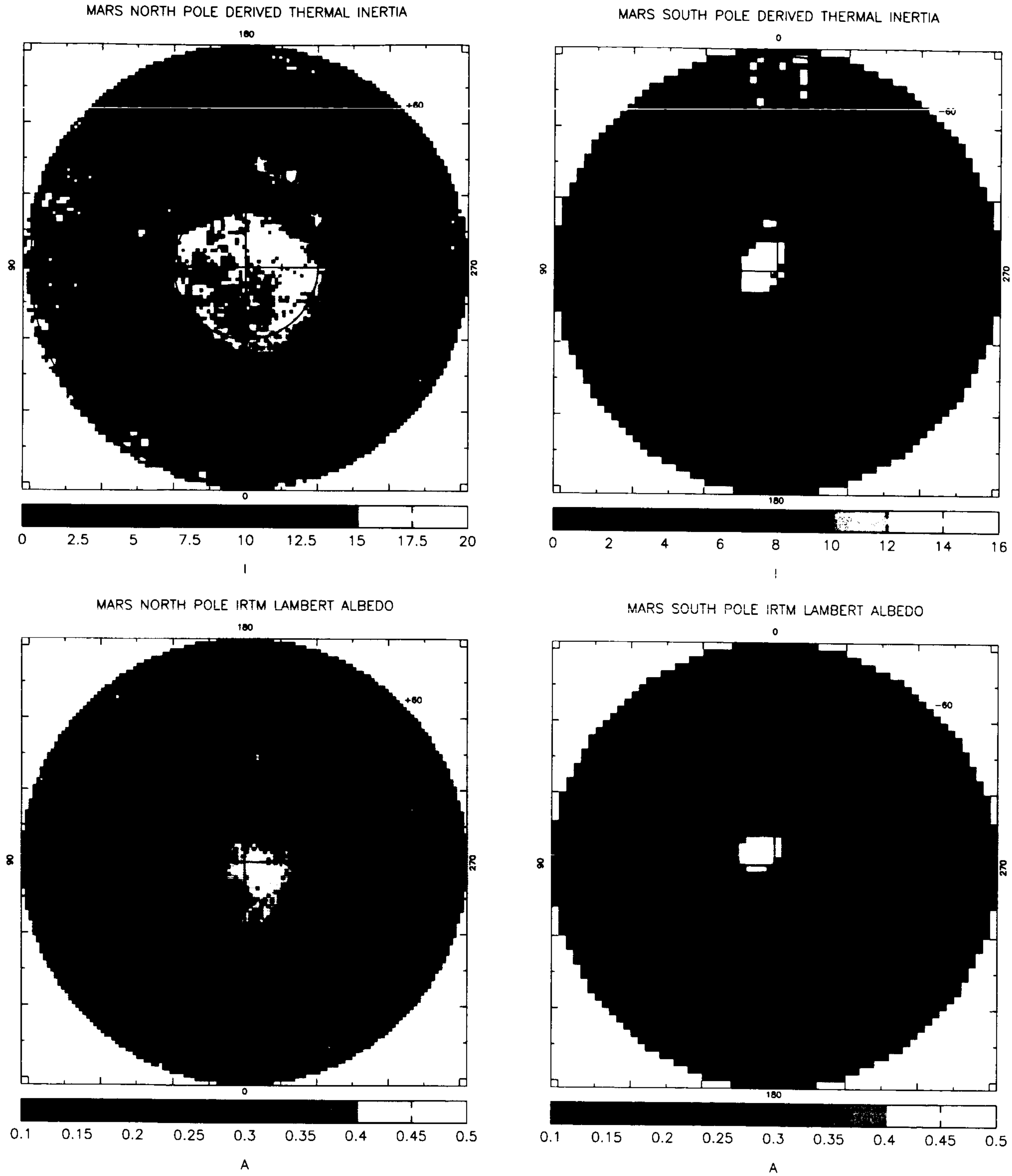
Here we present the first maps of the thermal properties of the north and south polar region of Mars. The thermal properties of the midlatitude regions from -60° to +60° latitude have been mapped in previous studies[1]. The maps presented here complete the mapping of the entire planet.

The maps for the north polar region were derived from Viking Infrared Thermal Mapper (IRTM) observations obtained between June 10, 1978 to Sept. 30, 1978 (L_s = 98.39 to 121.25, Julian Date = 2443670 to 2443720). This period corresponded to the early summer season in the north, when the north residual water ice cap was exposed, and polar surface temperatures were near their maximum. The maps in the south were derived from observations obtained between Aug. 24, 1977 to Sept. 23, 1977 (L_s = 321.58 to 338.07, Julian Date=2443380 to 2443410). This period corresponded to the late summer season in the south, when the seasonal polar cap had retreated to close to its residual configuration, and the second global dust storm of 1977 had largely subsided. Best fit thermal inertias were determined by comparing the available IRTM 20μ channel brightness within a given region to surface temperatures computed by a diurnal and seasonal thermal model. The model assumed no atmospheric contributions to the surface heat balance. Standard deviations of the model fits were typically less than 3K. Figures 1ab and 2ab show the resulting maps of apparent thermal inertia and average IRTM measured solar channel lambert albedo for the north and south polar regions from the poles to ±60° latitude.

Thus far, the major results of this work can be summarized as follows:

- Surface Water Ice: High albedo, high thermal inertia water ice deposits are widespread within the north residual cap, and in outlying deposits at latitudes as low as +74° . The diurnal thermal inertias derived here are consistent with seasonal thermal inertias derived from measurements of the polar heat balance[2], which implies that these deposits are dense and coherent from the surface to great depths. No surface water ice appears to be present in the southern hemisphere.
- Polar Dune Material: In the north, regions containing low albedo polar dune material can not be distinguished from the surrounding polar planes units solely on the basis of thermal inertia. Regions covered by dunes generally have intermediate thermal inertias, which is consistent with transportation by the martian atmosphere under current climatic conditions. The inertias of the polar dune materials are distinctly lower than the low albedo material that extends northward from the Acidalia region at 45° longitude. Large regions of exposed sand and rock are not present in the south polar region.
- Dust Deposits: The south polar region appears to be the site of a major new low thermal inertia region. The apparent inertias near the south pole are similar to those in the Tharsis and Arabia regions in the northern hemisphere, and are consistend with the presence of a dust layer that extends a depth of at least one diurnal thermal skin depth. The unique location of this deposit may provide clues to the processes responsible for the formation of the northern hemisphere low thermal inertia regions and the layered deposits at both poles. In sharp contrast to the south, there are no extensive regions of contiguous exposed low thermal inertia materials in the north polar region. If the north polar region is presently a major sink for material raised during global dust storms, then this material must be incorporated into the residual water ice deposits.

1. Palluconi, F. D. and H. H. Kieffer, *Icarus* **45**, 415 (1981).
2. Paige, D. A. and A. P. Ingersoll, *Science* **228**, 1160 (1985).



Figures 1-2. Thermal inertia and albedo maps of the north (left) and south (right) polar regions of Mars from Viking IRTM observations. The upper figures show derived thermal inertia in units of $\times 10^{-3}$ cal cm^{-2} sec $^{-1/2}$. The lower figures show measured IRTM Lambert albedo. (data points with values outside the limits of the gray scales below each image were mapped to the highest or lowest gray scale values.)